

# METHOD AND HOUSING ASSEMBLY FOR FARMING MEMBERS OF THE PHYLUM ARTHROPODA

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## DESCRIPTION

### RELATED APPLICATIONS

10 [Para 1] This application claims priority to United States  
provisional patent application having Serial No. 60/501,355,  
which was filed on September 9, 2003.

### BACKGROUND OF THE INVENTION

15 [Para 2] Field of the Invention

[Para 3] A method and a housing assembly for farming  
members of the Phylum Arthropoda in a centralized location  
to collect silk therefrom.

20 [Para 4] Description of the Related Art

[Para 5] Members of the Phylum Arthropoda, especially  
referring to spiders, are able to dispense different types of  
silk from their bodies. The various types of silk are used by  
the spiders for different purposes. For example, one type of  
25 silk excreted from the ampullate glands is commonly  
referred to as a dragline and is used when the spider

ventures from its web. The dragline is stronger than the other types of silk and the spider can climb back up the dragline if there is danger. The various types of silk have specific properties that make them useful for various applications, such as medical, pharmaceutical, or commercial applications. One medical application may use the silk for sutures because the silk is anti-bacterial and biodegradable, while also having very good tensile properties. The silk may also be used as artificial ligaments and to reinforce torn tendons. One commercial application may incorporate the silk into garments for replacing Kevlar vests currently used in ballistic protection.

[Para 6] However, extracting the silk from the spiders has been difficult. It requires large numbers of spiders to produce a large quantity of the silk to be commercially practical. Therefore, other methods of making the silk have been researched instead of collecting the silk directly from the spiders. One method has been to genetically alter goats so that the milk produced by the goat includes enzymes used to fabricate the silk. The enzymes are extracted from the goat's milk and then the silk is made from the extracted enzymes. Other methods have employed bacteria and the like to produce the enzymes for combining to make the silk. The silk made by these methods is useable; however, the silk typically does not have the same physical properties as the silk directly extracted from the spiders.

[Para 7] Various related art references disclose that it is impractical to collect the silk directly from the spiders. The silk produced by the spiders has a thickness of about 1/100th of the thickness of a human hair and therefore

many spiders must be used to collect large amounts of silk. It is known by those skilled in the art that the spiders are very territorial and exhibit cannibalistic tendencies when housed in close proximity with one another. Moreover, the  
5 references state that when many spiders are left together, only one will remain, as it will have killed the other spiders.

[Para 8] In order to farm the spiders, current methods employ separate cages that keep the spiders separate from one another. However, it has been discovered that the silk  
10 produced by the spiders in captivity does not produce the same high quality silk as produced by spiders in their natural environment. It is believed that housing the spiders in enclosed, separate cages increases the stress of the spiders and the increased stress results in the silk having  
15 inferior physical properties relative to silk produced from spiders in their natural environment.

## SUMMARY OF THE INVENTION

20 [Para 9] The invention provides a method and a housing assembly for farming members of the Phylum Arthropoda in a centralized location to collect silk therefrom. The assembly comprises a wall defining a plurality of frames and establishing an outer periphery defining a work space  
25 having a foot print of a predetermined area. Each of the frames defines an open frame space having a predetermined area for housing the members of Phylum Arthropoda to create a web therein. A roof is supported by the wall for covering the frames and the work space. The assembly is

characterized by a ratio of the predetermined area of the open frame space to the predetermined area of the foot print of at least 1:5 to prevent territoriality of the members of Phylum Arthropoda.

- 5 [Para 10] The method of farming members of the Phylum Arthropoda comprises the steps of disposing the frames about the work space, covering the frames and the work space for protection from exterior environmental conditions, and disposing a member of the Phylum Arthropoda in each  
10 of at least two different frames for building webs within the open frame spaces. A food supply is attracted into the open frame space from the exterior environment and the silk is harvested from the members of the Phylum Arthropoda.

- [Para 11] The silk collected from the members farmed in  
15 the housing assembly of the subject invention has properties and characteristics similar to that of the silk produced by spiders in their natural environment. The subject invention provides adequate space to reduce the stress of the members even though they are in captivity.  
20 The space is also adequate to prevent territoriality and cannibalistic tendencies of the members, while also creating a self-sustaining environment for collecting silk.

## 25 BRIEF DESCRIPTION OF THE DRAWINGS

[Para 12] Other advantages of the present invention will be readily appreciated, as the same becomes better understood by reference to the following detailed description when

considered in connection with the accompanying drawings wherein:

[Para 13] Figure 1 is a perspective exterior view of a housing assembly for farming members of the Phylum  
5 Arthropoda;

[Para 14] Figure 2 is a perspective interior view of the housing assembly taken along line 2-2 in Figure 1;

[Para 15] Figure 3 is a cross-sectional view of a wall taken along line 3-3 in Figure 2; and

10 [Para 16] Figure 4 is a close-up perspective view of an alternate embodiment of the housing assembly including a netting.

## 15 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[Para 17] The subject invention provides a method and a housing assembly for farming members of the Phylum Arthropoda 12 to collect silk therefrom shown generally at  
10 in Figure 1. The assembly 10 allows the members 12 to  
20 be housed in a centralized location without the members exhibiting territoriality tendencies. Specifically, the members of the Phylum Arthropoda 12 are members of the Order Araneae (Arachnida). The order of Arachnida includes  
25 spiders, all having a body divided into a cephalothorax and a short usually unsegmented abdomen, a chelicerae modified into poison fangs, leg-like pedipalpi, simple eyes, a web-spinning apparatus at the end of the abdomen, and respiratory lung sacs or tracheae in the abdomen.

Preferably, the members are from the Family Araneidae and the Genus Nephila. The Family Araneidae includes spiders that spin elaborate webs 20 and including over 2,500 species. The spiders vary greatly in size; some species of  
5 *Singa* are about 2 mm in length, while some of the *Nephila* can grow to over 45 mm. In the most preferred embodiment, the member of the Genus Nephila is a Nephila Clavipes (N. clavipes) spider. For clarity, the subject invention will be described with reference to N. clavipes or  
10 spiders without being limited thereto.

[Para 18] The N. clavipes spiders are preferably farmed in the regions, which they are commonly found. The N. clavipes spiders are found in the southeast regions of the United States through Argentina and Peru. The N. clavipes  
15 spider is most commonly found in Puerto Rico. Farmers in these regions are continually cutting down the rain forests for their livestock. However, these farmers could shift their resources from clearing the forests to farming the N. clavipes spiders due to the potential profitability of  
20 harvesting the N. clavipes spider silk as a valuable resource.

[Para 19] Referring to Figures 1–3, the housing assembly  
10 includes a wall 22 defining a plurality of frames 24 in close proximity with one another and disposed about a work space 26. Each frame 24 presents an open frame space 28  
25 having a predetermined area and the work space 26 has a foot print 30 of a predetermined area. N. clavipes spiders are disposed in each of at least two different frames 24 for building webs 20 within the open frame space 28. Said another way, there is only one spider per frame 24 and there

are many spiders within the work space 26 each having their own frame 24.

[Para 20] As shown in Figure 3, the spiders build three-dimensional webs 20 spanning portions of the frames 24.

5 Referring to back Figure 2, the frames 24 are shown adjacent one another and in a straight line on the wall 22 to the left of the work space 26. Alternatively, the frames 24 may also be disposed diagonally to one another to give the spiders more area, as shown on the other walls 22.

10 [Para 21] The assembly is characterized by a ratio of the predetermined area of the open frame space 28 to the predetermined area of the foot print 30 of at least 1:5. The areas are best illustrated in Figure 2. As an example, when the predetermined area of the open frame space 28 is nine  
15 square feet, then the predetermined area of the foot print 30 should be at least forty-five square feet. The ratio is important to prevent territoriality of the members of Phylum Arthropoda. Establishing such a ratio allows the spiders to build their webs 20 without infringing on neighboring  
20 frames 24 and inciting the territoriality tendencies of the spiders. This allows the spiders to be housed in a central location and farmed which has previously been thought unobtainable since the spiders are cannibalistic. Preferably, the ratio of the predetermined area of the open frame space  
25 28 to the predetermined area of the foot print 30 is as at least 1:9.

[Para 22] In a preferred embodiment, the predetermined area of the open frame space 28 is at least four square feet. The frames 24 may further comprise a top member 14, a  
30 bottom member 16, and side members 18 and the frames

24 are generally rectangular shaped. Other geometrical shapes may be used having less than or more than four sides, such as, but not limited, triangular, circular, or hexagonal, so long as the ratio of the areas is satisfied.

- 5 Preferably, when the frames 24 are rectangular shaped, the side members 18, the top member 14, and the bottom member 16 are each at least three feet long.

[Para 23] The predetermined area of the foot print 30 is preferably at least seventy-five square feet. The foot print  
10 30 may be any geometrical shape so long as the ratio of the areas may be established. Preferably, the foot print 30 is rectangular and the predetermined area of the foot print 30 is at least ten feet by ten feet. However, the foot print 30 may be other shapes, such as circular or octagonal without  
15 deviating from the subject invention.

[Para 24] In one embodiment, the wall 22 comprises a plurality of walls establishing the outer periphery. Each of the walls 22 has at least one frame 24 defined therein, and more preferably a plurality of frames 24 are defined therein.  
20 When the foot print 30 is rectangular shaped, there are four walls 22 defining the work space 26, whereas if the foot print 30 was circular, then there would be a single wall 22. The most preferred embodiment has the walls 22 that are each twelve feet long such that the work space 26 has the  
25 predetermined area of one-hundred forty four square feet. The frames 24 in this embodiment are four feet by four feet having the predetermined area of sixteen square feet. The ratio of the area of the frames 24 to the area of the work space 26 is 1:9.

[Para 25] Referring again to Figure 3, the frames 24 and the work space 26 are covered for protection from exterior environmental conditions, such as rain and wind. Since the frames 24 and the work space 26 are covered, an  
5 environment is created for the spiders such that the spiders have no reason to leave the frames 24. Also, since the frames 24 are spaced far enough from one another to prevent territoriality, the spiders are less stressed and will produce high quality silk to be harvested. The frames 24  
10 and the work space 26 are covered by a roof 32 supported by the wall 22. The roof 32 includes eaves 34 that extend perpendicularly beyond the wall 22 a predetermined distance. In order to protect the webs 20 created within the frames 24, the eaves 34 preferably extend perpendicularly  
15 at least two feet beyond the wall 22. More preferably, the eaves 34 extend perpendicularly from two to three feet. The roof 32 may have various pitches, so long as the eaves 34 extend perpendicularly from the wall 22 at least two feet.

[Para 26] With reference back to Figure 2, a light source 36  
20 is disposed within the work space 26 for drawing a food source through the open frame space 28 and into the web 20 from the exterior environment. The food source may be any type of insect and is preferably those insects that are naturally occurring in the environment where the housing  
25 assembly 10 is located. When the light source 36 is activated, the food source is drawn into the work space 26 through the open frame space 28 and is caught in the webs 20. Catching the food source in the webs 20 acts as a natural food source for the spiders and is yet another reason  
30 that the spiders do not defect from the housing assembly

10. However, those skilled in the art recognize that the spiders may also be fed by hand. The food sources may include insects selected from the following orders of Insecta: Orthoptera, Lepidoptera, Coleoptera, Diptera, Hymenoptera.

5 [Para 27] Another embodiment of the housing assembly 10 is illustrated in Figure 4. Even though the spiders have adequate space, protection, and food source, a netting 38 may be used to removably cover the frames 24. The netting 38 would be loosely positioned adjacent the exterior of the  
10 frames 24 for limiting defection of the members therefrom. The netting 38 allows the spiders to move about the work space 26, while preventing the spiders from leaving the housing assembly 10. Since farming the spiders may include a significant investment to collect the spiders, the  
15 netting 38 serves to protect the spiders from natural predators. The netting 38 is removable to allow the food source to be attracted through the open frame spaces 28 and then the netting 38 would be replaced. Using such a netting 38 does not cause the spiders stress and as such,  
20 the silk that is obtained has good physical properties.

[Para 28] The centralized housing assembly 10 is particularly well suited for harvesting silk from the members of the Phylum Arthropoda 12. One such method of harvesting silk is disclosed in United States Patent No.  
25 6,412,261, which is incorporated herein by reference. The member of the Phylum Arthropoda is removed from the open frame space 28 and silk is withdrawn. After the silk has been withdrawn, the spider is returned to the web 20 in the open frame space 28 to recover and to prepare for the  
30 next harvesting. Using such a housing assembly 10 and

method as disclosed herein, silk can be extracted from the spiders at rates of about 4,000 feet per 7.4 hours for each of the spiders. Therefore, the collection of the silk directly from the spiders becomes practical when employing the

5 subject invention. Moreover, since the other related art methods discussed above have yet to achieve spider silk with the same properties as naturally occurring spider silk, the subject invention has achieved the farming of spiders which has previously been thought not possible.

10 [Para 29] Obviously, many modifications and variations of the present invention are possible in light of the above teachings. The invention may be practiced otherwise than as specifically described within the scope of the appended claims, wherein that which is prior art is antecedent to the

15 novelty set forth in the "characterized by" clause. The novelty is meant to be particularly and distinctly recited in the "characterized by" clause whereas the antecedent recitations merely set forth the old and well-known combination in which the invention resides. These

20 antecedent recitations should be interpreted to cover any combination in which the inventive novelty exercises its utility. In addition, the reference numerals in the claims are merely for convenience and are not to be read in any way as limiting.

## CLAIMS